Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the described embodiments.

DETAILED DESCRIPTION

Representative applications of methods and apparatus according to the present application are described in this section. These examples are being provided solely to add context and aid in the understanding of the described embodiments. It will thus be apparent to one skilled in the art that the described embodiments may be practiced without some or all of these specific details. In other instances, well known process steps have not been described in detail in order to avoid unnecessarily obscuring the described embodiments. Other applications are possible, such that the following examples should not be taken as limiting.

In the following detailed description, references are made to the accompanying drawings, which form a part of the description and in which are shown, by way of illustration, specific embodiments in accordance with the described embodiments. Although these embodiments are described in sufficient detail to enable one skilled in the art to practice the described embodiments, it is understood that these examples are not limiting; such that other embodiments may be used, and changes may be made without departing from the spirit and scope of the described embodiments.

The operation and utility of electronic devices can often benefit from interaction with various accessory devices. Input devices can be particularly effective at enhancing utility as they provide new ways and manners for interacting with the device. Unfortunately, these input devices are often electronic in nature and often require cumbersome and easily misplaced charging and/or data cables for applying any number of firmware updates, content loading and charging operations to the accessory device.

One solution to this problem is to include a built-in connector with an electronic accessory device that provides a conduit for exchanging power and/or data between the accessory device and another electronic device. In some embodiments, the built-in connector of this accessory device can include a floating contact design. The floating contacts can be positioned in a recessed position when the connector is not in use and in an engaged position when the connector is in use. By stowing the floating contacts in a recessed position when not in use, the electrical contacts of the floating contacts can be prevented from experiencing excessive wear on account of rough or careless handling leading to scratching or degrading of the electrical contacts. The floating contacts can include a magnetic element that drives the floating contacts between the recessed and engaged positions. In some embodiments, the magnetic elements can be attracted to a magnetically attractable element within the accessory device when the connector is not in use. When the connector engages a connector of another electronic device, the connector of the electronic device can include one or more magnetically attractable elements that attract the magnets within the floating contacts with an amount of force sufficient to overcome the magnetic coupling between the magnets and the magnetically attractable element within the accessory device. In this way, the floating contacts can move between the engaged and recessed positions without any expenditure of energy by the accessory device.

The accessory device can also include flexible electrically conductive pathways that remain attached to the floating contacts in both the recessed and engaged positions. In some embodiments, the flexible electrically conductive pathways can take the form of one or more flexible circuits. In one particular embodiment, the flexible circuit can take the form of a number of electrically conductive pathways printed upon a polymeric substrate. The polymeric substrate can include a cutout pattern that allows portions of the substrate to accommodate movement of the floating contacts without placing an undue amount of strain on the polymeric substrate. In this way, the electrical coupling between the floating contacts and the flexible circuits can be maintained in both positions.

This application also discloses additional embodiments related to moving connector elements. In particular, various pogo pin embodiments are disclosed. Pogo pins typically include a spring-loaded depressible electrical contact. Some of the disclosed pogo pin embodiments include an internal movable magnet that cooperates with a spring to oppose depression of the electrical contact. Additional embodiments are disclosed that include movable magnets that are configured to assist in connection and/or alignment of electrical connectors.

These and other embodiments are discussed below with reference to FIGS. **1**-**11**; however, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes only and should not be construed as limiting.

Floating Contact Embodiments:

FIG. **1** shows a perspective view of a portable electronic device **100** suitable for use with embodiments disclosed herein. Portable electronic device **100** can represent a multiplicity of different electronic devices that include a laptop, cell phone, wearable device, tablet device, media device and the like. Portable electronic device **100** can include a display assembly **102** positioned within a front opening defined by device housing **104**. Device housing **104** is also configured to protect various electrical components disposed within device housing **104**. Device housing **104** can also define openings within which contacts making up connector **106** can be positioned. The electrical contacts of connector **106** can be configured to provide a means through which portable electronic device **100** can communicate with and exchange power with various accessory devices. A wide variety of accessory devices can benefit from such a connector including but not limited to a powered cover or case, an external battery pack enclosure, an external keyboard, a stylus, a wireless headset or earbuds, a docking station and the like.

FIGS. **2**A-**2**B show an exploded view of a connector configured to be built into an accessory device. FIG. **2**A shows protective cover **202**. Protective cover **202** can be formed form an insulating material along the lines of glass fiber reinforced nylon or any rigid polymer. Protective cover **202** could also be formed of insulating materials along the lines of ceramic materials. Protective cover **202** can have an exterior surface with a curvature suited to match a device surface to which it is designed to be coupled with. As depicted, protective cover **202** defines multiple openings **204***a*-**204***c* within which electrical contacts of the connector can be positioned. An interior portion of protective cover **202** can define a channel corresponding to each opening that accommodates at least a portion of an electrical contact of connector **200**. The channels defined by protective cover **202** can also help to guide the contacts between recessed and engaged positions. One or more of electrical contacts **206***a*-**206***c* can take the form of electrically conductive shells, as depicted. In some embodiments, electrical contacts **206***a*-